LIVING WITH THE COMPUTER

No.3: PUTTING YOUR COMPUTER TO WORK

Page 5 The resourceful home-help **Page 6** Write your own program **Page 10** Instant information: efficient and paper-free **Page 13** Your files at your fingertips **Page 19** Word perfect technique **Page 20** Future generations **Page 22** Read more about them

SUNDAY TIMES THREE-PART GUIDE

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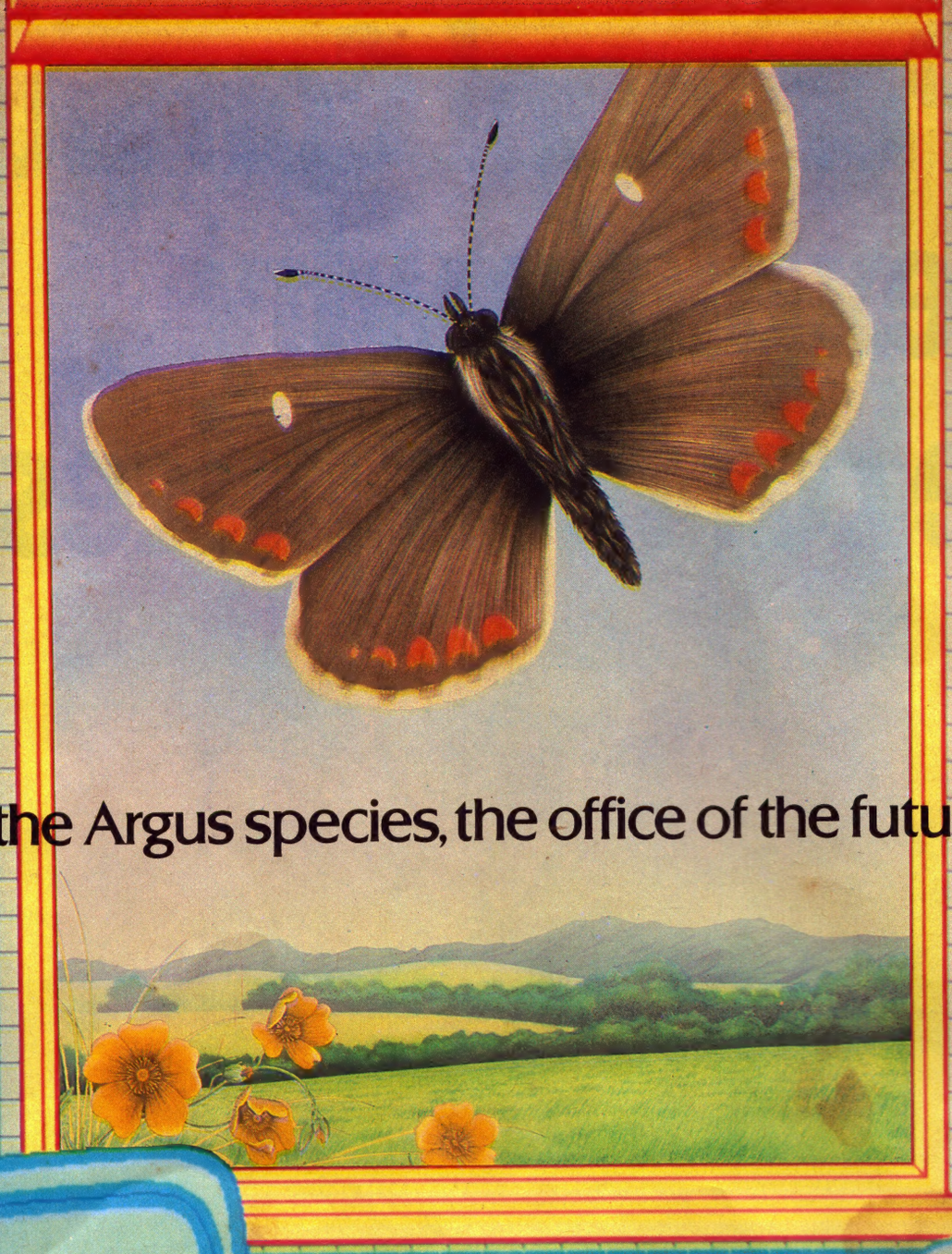

NORTHERN BROWN ARGUS
(Aricia artaxerxes)
Like its namesake, the Argus office product range, this very active butterfly is domiciled in Northern England. Look for it on rough grassy banks where its food plant, the rock rose, grows.

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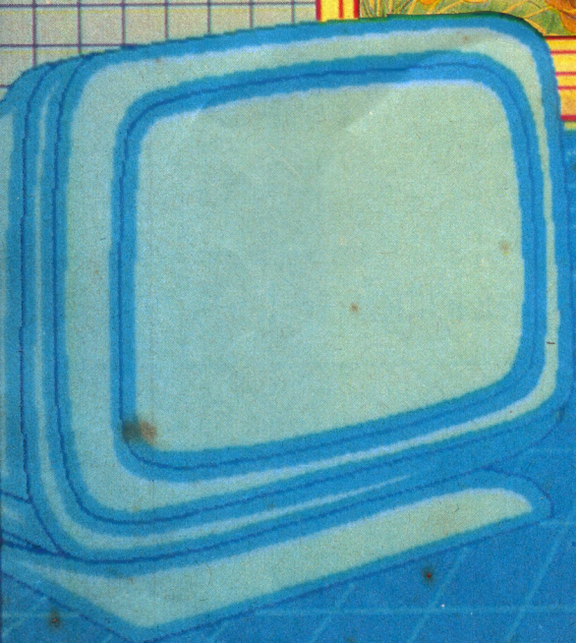

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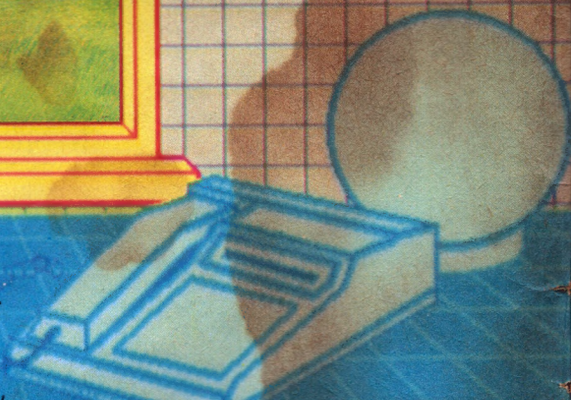

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- ☐ Pro-Personal Computer
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- ☐ Voice Manager

Name_____
Position_____
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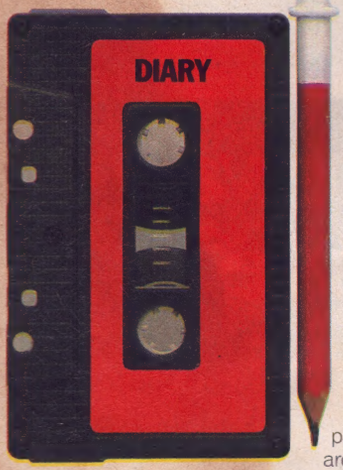
Most people want a computer to help them learn more, and to run their daily lives more efficiently. After mastering the software included with the machine, you will need to go further to make it work for you. Programs are available which can teach you almost anything under the sun, and you don't have to learn programming to be able to use them

LEARN HOW TO MAKE YOUR COMPUTER WORK FOR YOU

Apart from a games program, such as Pacman, your computer will probably come with another piece of software, called something like "An introduction to. . ." or "Getting down to Basic with. . .". These are designed to supplement the often poorly-written manuals, to give you experience in operating the machine.

The programs are mostly written in Basic and they play such games as Mastermind, a guessing game involving logic, which is easy to program and comes in about 500 versions for all microcomputers. One might begin by saying something like "Tell me your name?". You type in, say, Ron, and with a thin fanfare it will say, "Hello Ron! Welcome to the wonderful world of. . . computing". The screen will fill with several colours to show the machine's graphic capabilites and it's straight on with Mastermind.



The free introductory cassettes are not always boring and sometimes a game will be entertaining for a while.

The Spectrum "Horizons" tape, for example, is good at showing you how to use their complicated keyboard – but you won't learn much about the computer itself. Manufacturers might argue that this is not the intention of the tapes, but it should be. It certainly is possible to use a program to teach you about Basic, for example, but software like this doesn't come free with the machine.

So what can you buy that will teach you more? A quick survey of the computer press classified advertisements will reveal programs to teach you languages, O- and A-Level maths, spelling, evolution, wave transformations, music, astronomy, astrology, and (an American import only, brown paper-covered cassette box) making love. In short, if you're prepared to buy mail order and have one of the top six micro computers you can find a program to teach you almost anything – except how to use the computer itself.

Apart from playing games there are three uses people generally have for a computer: word processing, looking after finances, and keeping records. For these it is unlikely you will need to know anything about languages, such as Basic.

"User friendly" is the term that developed to describe computer programs that explained themselves as they went along, the idea being that you don't have to "learn" anything new at all. In practice, however, a well-written program should require no more than a couple of hours effort on your part.

As an example, let us take a card index program and call it "compufile". The advantages of a computer file are numerous (they are dealt with more fully on page 10) but the main assets are that the average computer system (with disk or microdrive) can store a complete filing cabinet's worth of information and can find anything you wish in a matter of seconds.

But supposing you bought a computer because you run a club and you want to keep records on it. You are used to file cards and pieces of paper and you are not expected to learn a whole new way of filing. Ideally, the computer would completely "mimic" your old system. How could the "Compufile" program help you to use itself?

The first thing to consider is the

screen display. "Compufile" enables you to "design" your own files on screen, dividing it up into various sections labelled Name, Address, Club Membership, Number and so on. You might also assign different colours to each section, just to make it clear. In fact it should be possible to make the screen design more or less the same as the cards you already use. Once you are satisfied that you have included all the information you need, the computer can store this design and use it as the template for each record. All you have to do is fill in the relevant details for each one.

"Compufile" will already "know" that you want everything sorted into alphabetical order but you tell it what to use as the basis of the sorting. Ordinarily this is the name of the person but it is possible you may want, for example, everything filed alphabetically according to street name.

"Compufile" can be user friendly in other ways. If you tell it to look for "wilson" when you should have typed "Wilson" it shouldn't have any problem. In fact, if you didn't know exactly which file you wanted but knew it began with "Wil", the "Compufile" program should be able to narrow the search and offer up, say, Wilson and Williams.

The important thing to note about the filing system is that you don't need to learn anything much about computers to use it. It was hardly different from your old paper filing system, except that it was a lot faster and less space consuming. "Compufile" represents a quick sketch of the ideal computer filing system and there are quite a few systems like it actually available for the home computers.

Like "Compufile", we can also take a program equally helpful

at planning accounts – "Compucalc". Visually, this mimics the "Spreadsheets" that are used by accountants (see Part One, pages 12-13). Again there should be little need to understand the actual workings of the computer, as the program itself should help you every step of the way. Described simply, "Compucalc" consists of a series of boxes arranged in a grid. You can refer to any particular box by giving its line and column position in that grid – a bit like finding a town on a map after having located it in the index.

What the computer now needs to know is what information each box should contain and how these items of information relate to one another. You might for example, have a column of figures in boxes A1 to A8. You can have this column totalled in A9 simply by telling the computer that box A9 will always be the total of A1 to A8, so whatever figures you put into the boxes, A9 will always contain the total. Obviously the boxes can have any mathematical relationship to one another you choose. For instance you may have a new box, A10, that contains A9 less 15% Vat.

"Compucalc" really requires no skills other than the basic mathematical ability you would need anyway to do the paperwork accounts.

With a word processor the aim must be that it is as simple to use as a typewriter except, of course, that it can do many more things. "Compuword" would enable you to layout the screen just as though it were the actual piece of paper you were typing on to; the "what ▶

PHOTOGRAPHS BY ALEX DUFORT

Editor: Tony Osman. Special consultant, Professor Dennis Parkinson, Queen Mary College, London Contributors to this issue: David Fairbairn, Jerry Sanders, David Taylor. Design: Pedro Silmon

you see is what you get" approach.

A few features should be common to the entire "Compu" range. There should be a "help" page which you can call up at any time – without needing to refer to the manual – so that you can summarise the main commands without constantly refering to the manual. Most important of all, the program should be "idiot-proof" so that any drastic error, such as erasing the memory completely, requires several key presses, with the irrevocable final one being preceded by something like "Are you sure?" coming up on the screen. In short, it should be impossible to watch five days' patient work vanish before your eyes – just by pressing the wrong key.

Assuming that the fictional Compu range does cover your main requirements, you'll need to find one for your particular computer. It's worth noting that for any serious purposes you'll need at least 32k of memory. The sort of programs described here will be called something like 'VU File' or 'VU Calc'.

Look also for names like "Spreadsheet" for accounts programs, or "Database" for filing programs. A quick test of how friendly they are likely to be is to look at the manual – if it seems difficult to understand you can bet the program will not be much better.

It is not easy to find programs that actually teach you about computers, but it is far less difficult to find programs for various common purposes that solve the problem by making computer knowledge unnecessary.

Assuming you bought your computer for these basic tasks, you need never buy a single book or magazine about computing at all. After all, many libraries use complex databases to store book information – librarians use them every day without knowing anything about computers.

Before we get on to word processor and database programs features in this issue there are other programs for home use which you might consider.

Keep fit

Body Temperature Control, £9.95, BBC. *Personal Fitness Program*, £11.50, Atari.

Home doctor

First Aid, £4.60, Spectrum. *How Long Have I Got?*, £3.90, Spectrum. *Complete Guide to Medicine*, £6.90, Spectrum.

Recipes

Robert Carrier Menu Planner, £9.95, Vic 20/CBM 64. *Computer Cook Book* (3 parts) each, £5.95, Spectrum.

Home finance

Money Manager, £9.99, Vic 20/CBM 64. *Future Finance*, £75.00, CBM 64. *Money Management*, £9.95, BBC/Electron. *Family Finances*, £34.99, Atari. *Mortgage and Loan*, £14.99, Atari. *Family Cash Flow*, £22.50, Atari.

Gardening

Shirley Conran's Magic Garden, £9.95, BBC.

Filing systems

My Secret File, £9.95, Commodore 64, Spectrum/BBC. *Desk Diary Package*, £9.95, BBC. *Data Genie*, £9.95, Spectrum. *Club Manager*, £50, CBM 64. *Diary 64*, £44.95, CBM 64. *Home Filing Manager*, £39.99, Atari.

Typing tutor

All Fingers Go, £14.95, BBC/Electron. *Touch Typing*, £19.99, Atari. *Typo Attack*, £14.00, Atari.

House and home

Cut your Heating Bills, £7.95, Spectrum. *Heat Losses*, £13, Spectrum.

NOW WRITE YOUR

You don't have to to be frightened of writing computer

You can work with computers for the rest of your life without ever needing to know about programming. But it is interesting to know how a program is written, and not that difficult to write a simple one. Writing a "real" program – one for business accountancy, for example, is difficult and takes an enormous amount of time. This is why such programs are expensive.

A program is a list of instructions to the computers that it will deal with in order – serially. When the "Fifth Generation" of computers arrives, with its ability to work through several sets of instructions at the same time, in parallel, program writing will be that much more complex.

At present, as the example to the right shows, the instructions are written out, one at a time, and numbered to tell the computer which one to carry out. Conventionally, they are numbered in tens – 10, 20, 30, 40, and so on: this allows you to add your "second thoughts". Instructions 22 and 42 are just such additions: they tell the computer to "clear the screen" so that the question is not left once it has been answered.

It is in general mercifully simple to correct errors in a program you have devised. You can, as in this example, put in extra instructions: the computer will insert them in the correct place, according to the number. If you have mistyped an instruction, you can simply type it out again, correctly, and the computer will accept the new version. And if you have made an error in an instruction so long that it would be tedious to retype it, you can edit the instruction itself.

The instructions are written in a formalised style called a computer language. The one used here is Basic. There are several slightly different versions of Basic, called "dialects". This program uses Spectrum Basic. It can easily be converted into the Basic that works on a different computer.

The first instruction tells the machine to print, in other words to display the sentence within the quotation marks. Sentences to be printed always need these marks. The programmer would type this entire line, check it and then use the key marked "enter" to put the command into the computer's "memory" (Sinclair computers

Is all word-processing software destined for an early grave?

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OWN PROGRAM

programs if you start with simple aims. This is a simple program that imitates one a bank might use for someone requesting a loan

```
  10 PRINT "What is your name? U
se your first name and press the
 enter key after every reply"
  20 INPUT a$
  22 CLS
  30 PRINT "Hello ";a$;" do you
want to borrow some money?"
  40 INPUT b$
  42 CLS
  50 IF b$="No" THEN PRINT "Sorr
y,that's that": STOP
  60 PRINT "You can borrow for a
 year.How many pounds would you
like?"
  70 INPUT c
  72 CLS
  80 PRINT "The interest rate is
 15 per cent.You will have to re
pay £";c*1.15;" Do you agree?"
  90 INPUT d$
 100 CLS
 110 IF d$="No" THEN PRINT "Sorr

scroll?
```

```
 enter key after every reply"
  20 INPUT a$
  22 CLS
  30 PRINT "Hello ";a$;" do you
want to borrow some money?"
  40 INPUT b$
  42 CLS
  50 IF b$="No" THEN PRINT "Sorr
y,that's that": STOP
  60 PRINT "You can borrow for a
 year.How many pounds would you
like?"
  70 INPUT c
  72 CLS
  80 PRINT "The interest rate is
 15 per cent.You will have to re
pay £";c*1.15;" Do you agree?"
  90 INPUT d$
 100 CLS
 110 IF d$="No" THEN PRINT "Sorr
y about that.Let's stop": STOP
 120 PRINT "Right.Let's go on"

0 OK, 0:1
```

The start of a simple program. It is designed to question a would-be borrower, and uses many of the standard instructions of its own special form, or dialect, of the Basic computer language. The loan applicant might imagine that the machine is communicating: it is actually following a completely predetermined routine.

ALEX DUFONT

make great use of keys that carry a complete order: you use one key for the order "PRINT").

The next instruction tells the computer to store what is typed in a memory "box" labelled "a$". The dollar sign, $, tells the computer that what is to be stored is a "string" – a group of letters or words. The computer uses this stored information in instruction 30, and we can see the result in the enlarged words from the screen below. The person answering the questions types in a name, in this case "Diana" and the computer seems to address her personally.

The same idea is used again, when Diana is asked if she wants to borrow some money. But this time, the computer has to make a decision. If Diana replies No, the computer, following instruction 50, brings the conversation to a close. Otherwise, it goes on and asks her how much she wants. This time she types in a number, which is not called a string because it is a number that is manipulated, and does not use the dollar sign. She actually asks for £50; we haven't reprinted this stage. Stage 80 manipulates her answer again. It is a calculation to work out the interest on whatever amount is asked for. This amount is multiplied by 1.15 (the asterisk, *, signifies "multiplied by").

Instruction 30 and 80 contain some apparently unorthodox uses of the semicolon: the computer needs these to distinguish between the parts it is told to print and the string or number it has to retrieve from its memory before printing. In lines 50, 110 a colon separates one set of instructions from the next.

```
What is your name? Use your firs
t name and press the enter key a
fter every reply
"Diana"

Hello Diana do you want to borro
w some money?
"Yes"
```

A simple example of apparent friendliness. The computer has been told, in instruction 30, to reply using the name it has just been given, and once it has been told that 'Diana' is at the keyboard, it addresses her by name. Following this, it must make a decision. It asks a question: Diana's answer will appear in the bright patch below. The machine has two possible actions

```
The interest rate is 15 per cent
.You will have to repay £57.5 Do
 you agree?
"Yes"
```

In the first two lines, the machine calculated the exact interest on the amount Diana wanted. Then, again, it has a decision to make

Just below line 80 the question "scroll?" appears on the screen. This is because the computer knows that the program extends beyond the bottom of the screen, and it is asking if we want the program scrolled, the equivalent of rolling the paper upwards. The operator would enter "y", for yes: this would cause the computer to move the program up to the position shown in the second picture.

As the enlarged picture from the screen shows, Diana is told that she will have to repay £57.5 if she borrows £50, and she is asked if she agrees. Her answer goes, as a string, into memory box "d$" of the computer, and the computer then follows instruction 110, to look at her answer and make a decision, either to stop, or to continue with 120. And so on.

This simple example has used the instruction to print, it has accepted answers and based the next action on them, it has made mathematical calculations – all essential elements in programming. There are others – instructions to generate random numbers, for example, and the instructions needed to send the computer around a series of "loops". A loop is used where instructions have to be followed repeatedly. If you want the machine to display the square of all numbers from 1 to 100, you would tell it to take these numbers in turn and multiply each by itself, where "multiply n by itself" is the loop. (This example is not written in Basic.)

There are instructions that tell the computer to display graphica elements that can be built into pictures, and other instructions that tell it what colours to use. There are even instructions to tell it to make noises or sound musical notes.

The handbook that comes with your computer explains how to write programs in that computer's version of Basic. And there are, fortunately, many books that help you over the patches that are difficult to follow in the official manual.

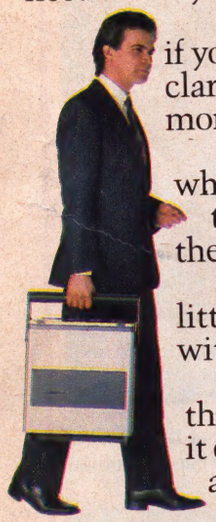
To get the mo you really

You can take it here, you can take it there, you can take it almost anywhere.

You can carry it in one hand, take it in your car, store it beneath an airline seat, or place it on the corner of your desk.

It's the Commodore SX64 portable.

Although it's portable, it is more powerful and has more features than many computers several times its size (and several times more expensive). So you won't only need to use your feet.



Your eyes will come in useful if you're to truly appreciate the clarity and colour of the built-in monitor.

Your fingers will be essential when it comes to working both the detachable keyboard and the integral disk drive.

You may even need to use a little of your brain just to keep up with the enormous 64K memory.

And your hands... well, they'll certainly be a help when it comes to packing up the SX64, and picking it up, too.

(It measures 14½" × 14½" × 5" and weighs under 25lb, so you won't need much muscle.)

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The Commodore SX64 portable costs around £895.00.

Included in this price, and thrown-in absolutely free of charge, are four software packages: Easy Script word processing, Easy File, Future Finance and the business game, High Flyer. These alone could cost you well over £210.

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INSTANT INFORMATION: TIDY, EFFICIENT, PAPER FREE

Though we think of computers as prodigious calculators, their ability to handle vast amounts of information is even more striking. Data that occupies many filing cabinets can be stored on the small disks of a computer, and information can be sorted and retrieved in ways that were virtually impossible in pre-computer days. Latest developments bypass the need to issue commands via the keyboard

Storing information in computer files is not done by magic: it all has to be laboriously typed in at some stage. There also has to be some kind of structure so that the user can find particular items quickly, and that structure needs to be worked out before any data is typed in.

For a computer, the handling of data causes more problems than its content; and this is particularly so with microcomputers. As storage capacity is relatively limited, and the actual computing speed is lower, efficiency in storage and retrieval is vital.

The main trouble in all computer systems is that electronic storage does not work like human memory. Humans can recall information from memory without having to know where it is, and can make connections between different areas of information without conscious thought. For computers, each item of data is in a fixed location and connections between items have to be made.

Various methods have been used to impose structure on computer data, and organise it so that it can seem more like human memory. The simplest method is called sequential, and means that all the records in the file are stored one after the other, in order. The order can be alphabetical, in order of employee number in a payroll file, or in order of anything else.

This method means that the user can find a particular record, but finding it means starting at the beginning of the file and going through until the required record is found. The spinning reels of tape, so popular when computers are shown in films or on TV, use sequential storage devices – finding a particular item could mean going through the whole reel.

Sequential files are fine for some applications, such as storing names and addresses for printing on envelopes. But a more popular and effective structure, now that magnetic disks are available, is random access. Here the definition is that the user can reach any record in a file in the same time, wherever it is physically stored.

It is random access that makes computer data storage so powerful, letting the user pull out any information necessary. Questions like "How many employees who are not in the pension scheme earned more than £10,000 last year?" can be asked and the answering list quickly retrieved from the stored records.

The computer can do this by using a set of "indexes" that help it keep track of the data. And that brings us back to entering the data, and to the structure that needs designing before any information can be stored efficiently.

Designing a structure

The data entry structure, or "entry-form" is crucial to data handling. Anything that makes the job of entering data at a computer keyboard easier, and to make the stored data more accurate, can only save trouble later.

Most microcomputer database programs – software packages that handle storage and retrieval of information – allow the user to design forms on the computer screen. These forms often look like index cards, broken up into separate "data fields" where the information will be entered. The choice of fields, their position, and their size, is up to the user.

It is these fields that provide the computer with the first level of indexes it needs for random access. Once the fields are designed the user can choose to index any or all of them, and this gives the computer an internal structure that lets it find selected information.

There is no need to go into any detail about this internal structure, since the user never sees it in action. The only thing that matters is that the user, by indexing certain fields, tells the computer which parts of the data are most important for later retrieval.

Once the form has been designed, data entry is a simple – and very boring – job. The computer puts a blank form, or template, up on the screen, and the cursor appears in the first data field. The operator types in the appropriate information and hits the 'return' key; the cursor then moves to the next field. Once all the fields of a particular record have been entered and checked for accuracy, the record is stored and another blank form put on the screen. And so on, until all the information has been entered.

It cannot be emphasised enough that there is no way round this process. Many small businesses buy a microcomputer system to replace their manual records and ledgers, and do not realise that the computer can do nothing until all those records and files have been transcribed on to disks in a form that the computer can use. This transcription can take many months, or even years. Imagine the volume of work involved in putting all driving licence records on the big DVLC computer at Swansea, or putting all criminal records on the Police National computer at Hendon.

Retrieving data

The problems of computer data handling do not end once the data is entered. Requests for information retrieval need to be given to the machine in a form that it can understand.

Once again, this is not the natural process it might seem. It is easy, mentally, to form the questions you need answering: but typing that question on the computer keyboard will just produce an error message on the screen. In most cases, and in just about all cases when microcomputers are involved, special commands need to be learned to get the required data out. These often look like mathematical formulae with a few alphabetic sections in among the symbols, and cannot be described as natural in any terms.

On large machines the database software manufacturers have tried to make retrieval more 'friendly', allowing the users to enter their requests just as they think them. That question about employees not in the pension scheme could be typed in just as it was given earlier, and the computer program would extract the information it needed to find the required data and put it on the screen.

But that takes us into the hazy world of artificial intelligence, since the software needed to translate 'natural language' questions into questions the computer can answer is very complicated indeed. Only the biggest computers can

take on that kind of job alongside the more prosaic job of organising the data and creating the indexes.

Large computers have other advantages too. More complex data structures, which allow more complex requests to be made, can be created when the computer has large amounts of storage space and spare processing power.

Mouse strikes back

Recently, the microcomputer has been striking back. Various software houses and hardware manufacturers have come up with really innovative products that cannot be matched on the giant machines.

The most visible is Apple, which shook things up with its Lisa and Macintosh computers. These can be used without touching the keyboard at all – except for entering all the data records, of course. A 'mouse', a small box that slides across the desk and moves the cursor, is used to point to easily-understood symbols on the screen.

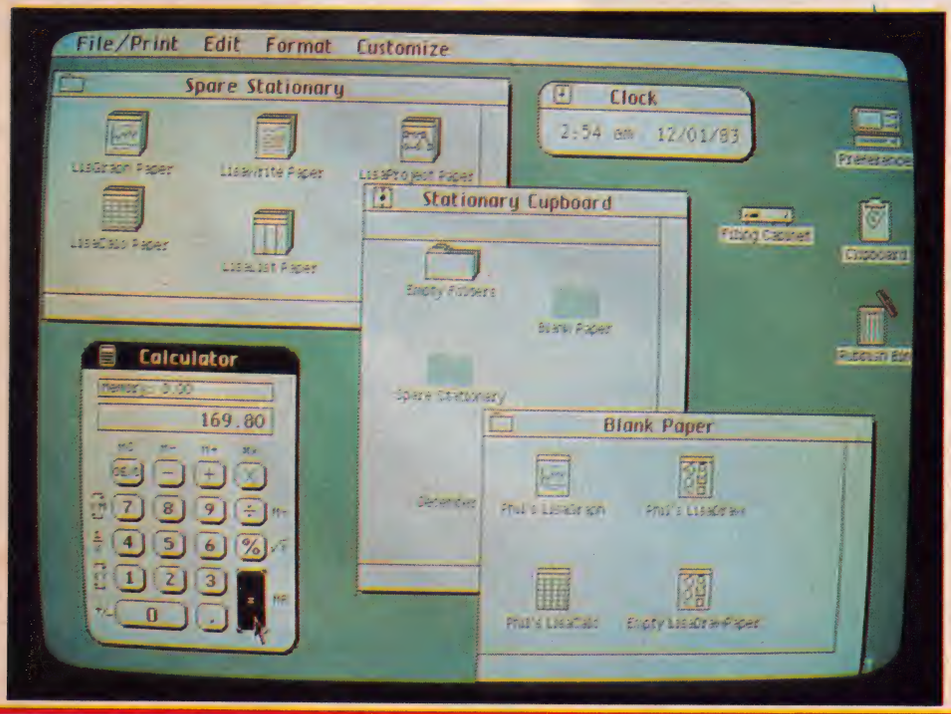
The Lisa and Macintosh turn the screen into a desk-top. The documents you are working on look just like sheets of paper on a desk, displayed in screen 'windows' that can be changed in size and shape with the mouse. A document in a window can be brought to the 'top' of a pile on the desk with one mouse command, and the keyboard can be forgotten.

Around the desk-top display are various symbols, called 'icons', to represent things you might want to do with your documents. For example, a dustbin symbol is used as a wastepaper basket; just put a document on the dustbin, press the mouse button, and the document has been discarded.

More relevant to data handling is a filing cabinet symbol. One command opens the cabinet to display a list of the files it contains; a second selects one of the files and opens it; and other simple mouse commands can pull out the information required. No special keyboard commands are needed, and even the keyboard itself becomes irrelevant.

Apple's technique relies on hardware, on a special high-resolution screen and on a powerful 16-bit microprocessor. Other companies have tried to do the same thing, with windows and icons, in software on standard machines such as the IBM PC. VisiCorp has its VisiOn "environment"; Microsoft has its MS-Windows; Quarterdeck has its DESQ system; and integrated packages such as Open Access use the windowing method to make the products more "user-friendly".

The whole idea of these products, and the whole thrust of microcomputer data handling, is to shield the user from the internal workings of the machine and to make retrieval of stored information as natural as possible.



A computer can store enormous amounts of information. Here at Lewis and Jones Ltd, Derby, medical card records are put into a computer. "User-friendly": the Apple Macintosh, helps its user with pictures, left, representing filing equipment (described in American spelling). A desk-top "mouse" moves the cursor to the screen symbols

PHOTOGRAPH BY PETER LAVERY

'Once a year, for the past five years, Sir Clive Sinclair has stunned the computer world by introducing a computer product that breaks new ground in both price and technology. With his new QL micro, he has done it again.'

Personal Computer News, February '84

'Sinclair have opened a whole new market for computers by marketing the QL at such a low price. It would be an ideal machine for estate agents, shopkeepers, colleges, schools, hobbyists and who knows who else.'

Electronics and Computing, March '84

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Soft, March '84

'... for £399 the QL offers the sort of package that would cost you getting on for 10 times that sum elsewhere in the marketplace.'

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'At its price, it is going to be well nigh impossible to beat.'

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"It is very difficult not to be carried away by the QL" Personal Computer News

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sinclair

Developments in micro-electronics mean that a long day at the office may soon become a thing of the past, simply because the office itself is on the way out. And as for the business conference – it may never be the same again, thanks to the video

ALL YOUR FILES AT YOUR FINGERTIPS

The completely automated office is now a real possibility, made possible through a combination of microcomputers and telecommunications. Microcomputers in everyone's grasp have made computing a humdrum exercise which everyone can be involved in at the touch of a button. Telecommunications can now link up microcomputers, even on opposite sides of the world, allowing executive users to share the same corporate information instantly.

There will, no doubt, be all sorts of problems before the fully automated office is widespread. There is the problem of the executive who cannot use a keyboard well and does not want to use it clumsily. And there is the problem of limiting the sheer volume of electronic mail. But the automated office is on its way.

What does this mean in practice? Let's take an American company, distributing mechanical equipment throughout Europe, with a European head office in Geneva, and regional centres in each country. Say the Birmingham depot receives an urgent order to supply a local UK company. The order is entered into the regional manager's personal computer (PC) (which incidentally is also used as a word processor to produce letters and reports, and as an electronic spreadsheet to prepare cash flow analyses and sales prediction charts). This PC is connected to the local minicomputer that handles stock records and sets off an automatic search to fill the order. But the search fails: the merchandise is out of stock locally.

The minicomputer, however, like all the different regional minicomputers, has a telecommunications link to the company's mainframe in Geneva – where an up-to-date copy of all the European stocks is maintained. The search continues automatically in Geneva and the nearest physical location of the required goods in Europe ▶

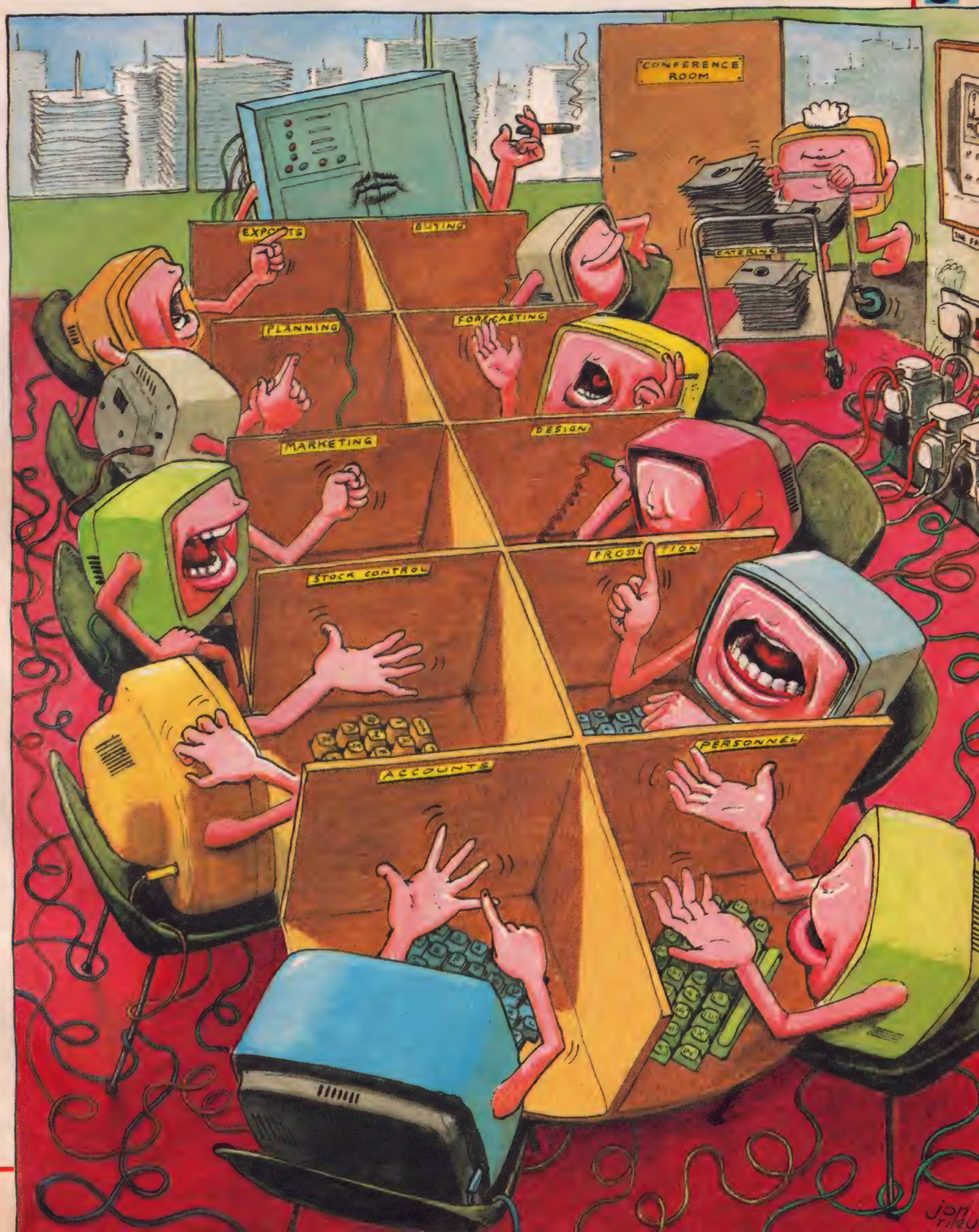
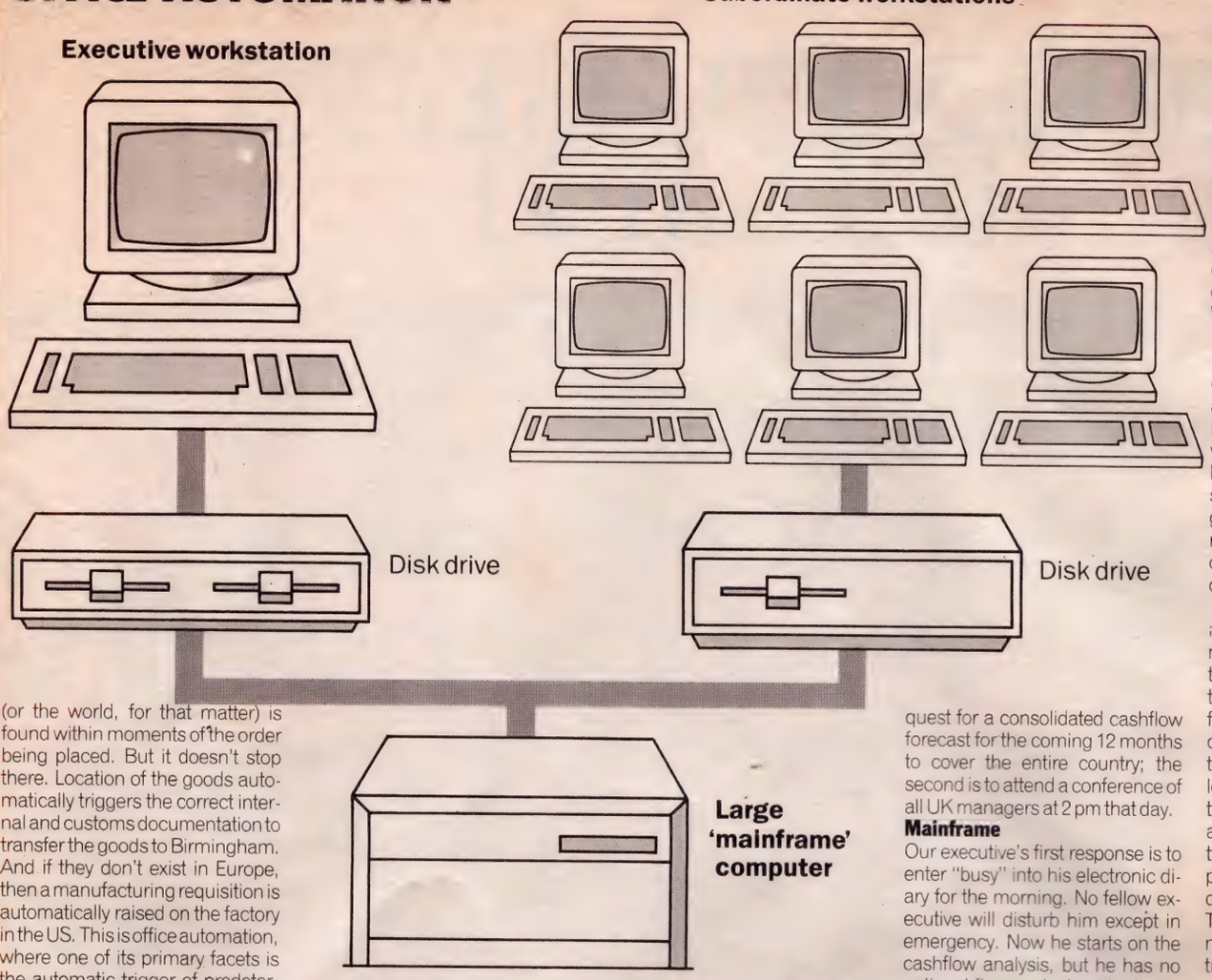


ILLUSTRATION BY JOHN RILEY

OFFICE AUTOMATION



Networks can be local – linking computers on the desks of company staff with one another and with the company mainframe – or global, using Telecom Gold, or some other electronic mailbox

(or the world, for that matter) is found within moments of the order being placed. But it doesn't stop there. Location of the goods automatically triggers the correct internal and customs documentation to transfer the goods to Birmingham. And if they don't exist in Europe, then a manufacturing requisition is automatically raised on the factory in the US. This is office automation, where one of its primary facets is the automatic trigger of predetermined actions at several different locations.

Bar code readers

Office automation, however, is not the prerogative of the multinational corporation. Many chemists are now using hand-held computers to perform automated stock taking and re-ordering. These computers include bar code readers, which can sense and interpret the pattern of wide and narrow lines taped on to shelves and associated with individual stock items. The chemist need only pass the reader over the bar code and then key in the shelf quantity. In this way he can store the stock item and quantity in the computer in a matter of moments, and he can repeat the procedure for the entire stock.

At the end of the day the chemist's computer is attached to a telephone with a link to the pharmaceutical supplier's mainframe computer, which contains all the stock reordering details for each chemist. If the levels it receives over the telephone are below the reordering level, then a purchase order is automatically raised and a requisition sent to the warehouse. The required goods are then located and despatched with the morning's deliveries, and the chemist receives stock replenishment automatically and in time.

Office automation is not just a matter of speed it is a new attitude towards commerce. We are entering an age where both physical and conceptual boundaries are being eroded by computers and telecommunications. Geographical distances, and even national boundaries, lose much of their significance when data can be passed instantaneously over, under and across entire nations. But even the concept of the office itself is under threat of being outmoded.

Portables

Let's take a business executive in London, with a head office in Manchester, who may or may not have a personal secretary, but who does have a personal computer on his desk, linked by telephone to the company mainframe in Manchester. It is also linked, via a local area network, to all the other PCs in the London office, giving, among other facilities, a local electronic mail.

One weekend, to get out his monthly report, he takes home his small battery-operated portable computer that can be linked to his office PC. Instantly, his home becomes a weekend office. When he needs information from his office PC he simply draws the data down a telephone link and incorporates it into his report.

Similarly, he may be travelling into London on his normal commuter train with a busy day ahead. Keen to make a good start, he enters a series of memos for fellow executives into his portable computer: his office is now courtesy of British Rail.

Once at his traditional office he glances through the day's mail – which is devoid of any internal envelopes (for this he turns to his PC and invokes the electronic mail system). He looks in his electronic mailbox – nothing yet, but it is only 8.30 on a Monday morning. Instead, he links the portable to the PC and transmits the monthly report and all his own memos into the system. He finalises the report with the PC's word processor; the memos he enters into the electronic mail system.

By 9.15am he has finished, and checks his mailbox again. Two important requests have arrived: one from his local regional manager, and one from the managing director in Manchester. The first is a request for a consolidated cashflow forecast for the coming 12 months to cover the entire country; the second is to attend a conference of all UK managers at 2 pm that day.

Mainframe

Our executive's first response is to enter "busy" into his electronic diary for the morning. No fellow executive will disturb him except in emergency. Now he starts on the cashflow analysis, but he has no national figures. Instead he has a personal computer with its own spreadsheet analysis system, and a linking package to the Manchester mainframe. Once in connection the mainframe starts prompting him for information. Which database does he wish to use? He enters ACCOUNTS. It tells him the structure of the records available (sensitive information has been protected and cannot be accessed unless his own personal computer has a suitable password). He defines the data he wants, so that the required data, and nothing else are passed to the PC in London.

While this is happening the executive turns back to his monthly report. Since it is now finished it can be distributed. It is released on to the electronic mail system to other executives. Three printed copies are also produced automatically: one at the regional manager's printer, one at the library in the basement, and one at head office in Manchester. By now the analysis data interrogation is complete and the executive's PC contains all the data necessary to produce the cash flow projection. It has been stored in the PC in VisiCalc format, and therefore is available for network to other computers using any of the standard spreadsheet systems.

Since this current request from the regional manager is not the first, our executive has taken the precaution of storing the model he created for the last national projection. As a result, he can recall this model and run the new data against it. The result is an up-to-date national cash flow projection report, complete with coloured pie-charts and histograms, produced in little more than an hour. And it's still only 11.30am; time enough to check his electronic mailbox for day-to-day problems.

Video conference

By 12.30pm our executive is turning his thoughts to the Manchester conference with the national manager. After a leisurely lunch, he leaves his office at 1.50pm, and walks down the corridor, meeting his fellow executives doing the same. By 1.55pm they have all congregated in the London conference room, and each is facing a video camera and monitor. Conference can begin.

This is office automation, where repetitive jobs are performed automatically, and executives are freed to work where they wish, and when they wish. And if any of it sounds futuristic, it isn't! There are few companies that can yet boast all of these capabilities, but nevertheless all these facilities are available today. The British-made Husky and the Japanese Epson HX-20 are two excellent portables. The latter product has been adapted by one distributor, and adopted by British Telecom, to provide a portable terminal for BT's Telecom Gold electronic mail system – which provides a national electronic mail network.

There are innumerable local area networks that can link together the different PCs and other office equipment within small sites (with up to, say, 50 kms of linking cable); and a growing number of software packages that can link PCs to mainframes. The IBM PC has given the micro market a stability and maturity it had hitherto lacked, and the quality and sophistication of both applications and communications is rapidly growing. And the final element of videoconferencing is now available from British Telecom.

So, what of the future? We can expect data networks to become as all-pervasive as the current electricity networks. New equipment will plug directly into the data channel built into the office (and home!) in the same way as we plug a toaster into the mains circuit. The final boost will come with the transition of the existing telephone network to the new System X digital network suitable for both voice and data transmission. This will mean that computers and computerised equipment can connect simply and directly to the telephone network; and when this happens, the automated office will be as large as the network itself.

JOHN GRIMWADE

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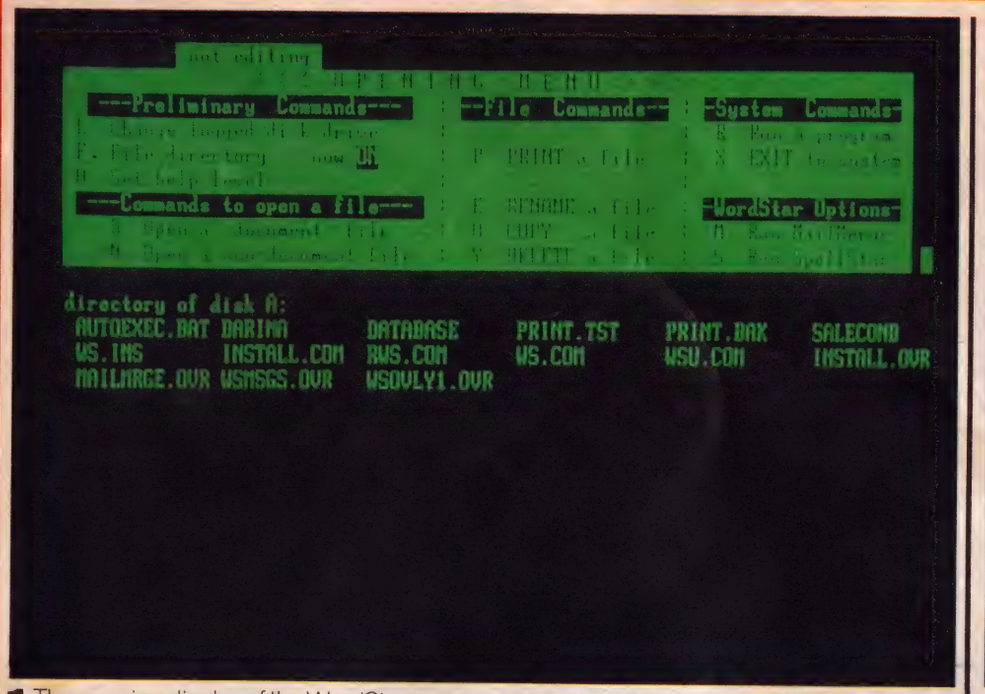
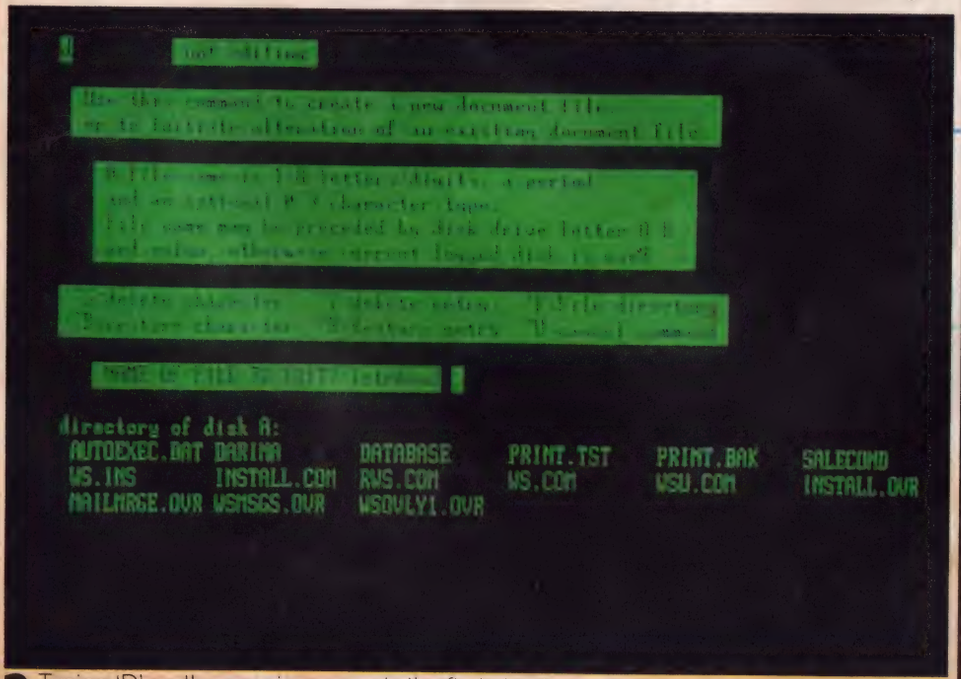
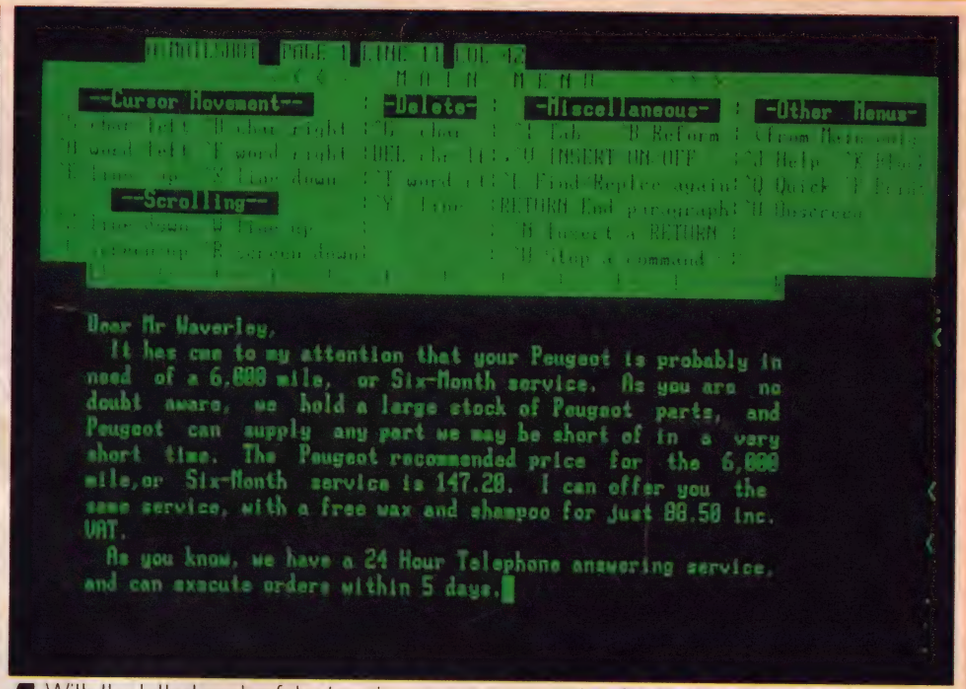


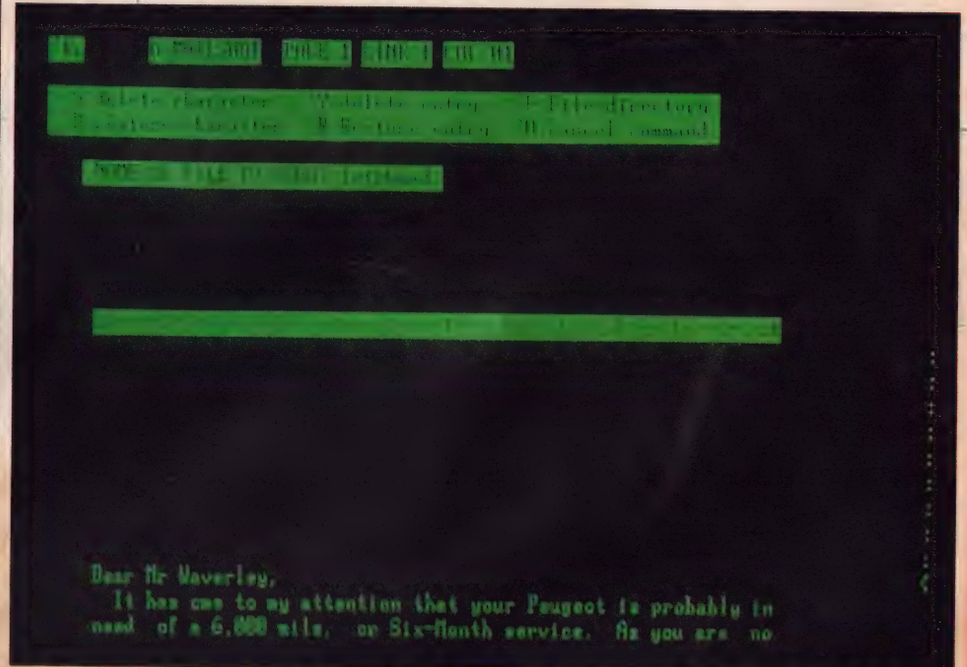
1 The opening display of the WordStar program gives a menu which lays out the commands available to the user at this stage. Typing a single letter selects one of the commands, which cover major functions like starting to edit or printing a document. Below the menu is a directory of all files on the "logged disk", the disk the program is currently working on


directory of disk A:
AUTOEXEC.BAT DARINA DATABASE PRINT.TST PRINT.BAK SALECOMD
WS.INS INSTALL.COM RWS.COM WS.COM WSU.COM INSTALL.OVR
MAILMRGE.OVR WSMSGS.OVR WSOVLY1.OVR

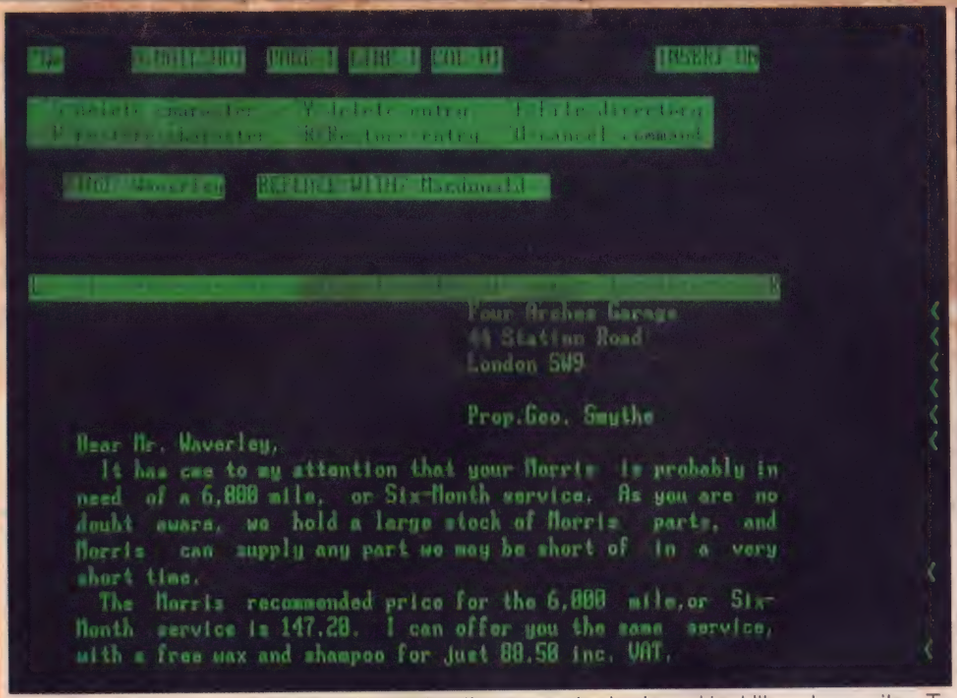
2 Typing 'D' on the opening menu is the first step in producing a document, and the program gives helpful information on what the command does and what the restrictions are in naming the document. Here we want to produce a letterhead, so we call the file "letrhead". This is a new file name but the identical command is used to call up an existing document


--Cursor Movement--
-Delete-
-Miscellaneous-
-Other Menus-
--Scrolling--
Dear Mr Waverley,
It has come to my attention that your Peugeot is probably in need of a 6,000 mile, or Six-Month service. As you are no doubt aware, we hold a large stock of Peugeot parts, and Peugeot can supply any part we may be short of in a very short time. The Peugeot recommended price for the 6,000 mile,or Six-Month service is 147.20. I can offer you the same service, with a free wax and shampoo for just 88.50 inc. VAT.
As you know, we have a 24 Hour Telephone answering service, and can execute orders within 5 days.

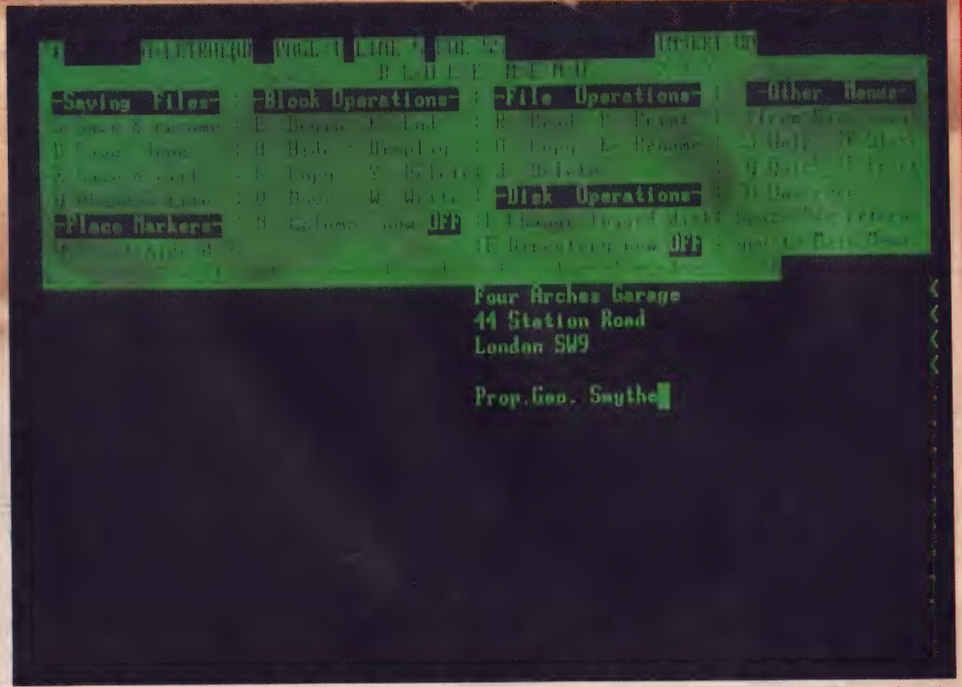
4 With the letterhead safely stored, we can open another file for the main part of the letter. The letter is going to be a mailshot, so the file is naturally called "mailshot". The "main menu" shown gives all those simple editing commands, including ways of moving around blocks of the text, deleting characters, words, or lines, and reformatting text to fit the margins


Dear Mr Waverley,
It has come to my attention that your Peugeot is probably in need of a 6,000 mile, or Six-Month service. As you are no

5 Our mailshot now needs a letterhead, and this can be called in from the disk. On the "block menu" (shown on the screen in 3), one of the commands is "read a file" and this can be used here. Typing '^K' again, followed by 'R', prompts the program to ask which file we want to read. Entering "letrhead" copies this file into the right place on the mailshot letter


Four Arches Garage
44 Station Road
London SW9
Prop.Geo. Smythe
Dear Mr. Waverley,
It has cme to my attention that your Morris is probably in need of a 6,000 mile, or Six-Month service. As you are no doubt aware, we hold a large stock of Morris parts, and Morris can supply any part we may be short of in a very short time.
The Morris recommended price for the 6,000 mile,or Six-Month service is 147.28. I can offer you the same service, with a free wax and shampoo for just 88.50 inc. VAT.

3 The letterhead has been typed in, using the computer keyboard just like a typewriter. To store it on disk, another menu has been called up by using the "control" key (indicated on screen by the symbol '^') and typing 'K'. This menu shows a new set of available commands, and typing 'D' at this point saves the letterhead and returns the opening menu to the screen



6 The mailshot form letter is now complete, but it is written to a Mr Waverley throughout. Producing a similar letter for a Mr Macdonald is simple using a "find and replace" command, '^A'. We then just tell the computer to find "Waverley" and replace it with "Macdonald" throughout the letter. "Peugeot" has already been replaced by "Morris" in a similar fashion

THE TECHNIQUE OF BEING WORD PERFECT

Probably the most useful computer activity for the general user is word processing – compiling and editing text on the computer. Word processing programs are capable of great subtleties, and the best versions can take charge not only of the content of a text, along with its layout and printing, but of its merging with other texts. This article outlines the possibilities of one particular program; the example, above, shows some of the stages involved in drafting a circular letter

At one time, word processors were expensive machines used for just that one job, and were well beyond the budget of small businesses. Now, the combination of a small microcomputer and a word-processing program can do the same job much more cheaply – and the computer can be used for many other business jobs as well.

So it is natural to find word-processing programs near the top of the microcomputer business software charts. Even very small businesses producing very few documents have found that a word processor expands their horizons. Personalised mail shots, with each letter looking individually typed, are simple and quick to produce. Reports can be written faster, without mistakes, and changes and rearrangements made without retyping each time. And copies of all reports and letters are instantly available from disk without messy carbons or illegible photocopies.

For all these functions, the software writers have tried to provide helpful information and instructions for the user so that the word processor can be fruitfully used as quickly as possible.

Loading a program like MicroPro's WordStar into a small microcomputer turns the computer screen into a sheet of paper, and the computer keyboard into a typewriter. But it is an endless sheet of paper, and the keyboard can do a lot more than a typewriter's. Words are typed in the normal way, and the user will find that – as usual – mistakes will be made. With the computer, these can be corrected on the screen without correcting fluid and without wasting paper.

Beyond this simple use is the real power of the word processor. Sentences, paragraphs, and whole pages can be marked and moved anywhere else in the document, and standard sentences, words, paragraphs or pages can be pulled in from other files on the disk and inserted where they are needed. A form letter can be created with marked gaps, and the gaps filled with the appropriate addresses, names, and figures taken from company records held on disk. Then all the envelopes or labels can be typed from the same company files.

All this is fine, but perhaps makes it sound too easy. Because of the many things they can do and because of the many commands that need to be learned, word-processing programs are complicated to write and can be daunting to use. However, those who do learn the technique soon wonder how they ever got by without it.

The programmers do their best to make word processing like typing, and build large amounts of "help" information built into the packages. And various computer dealers and training companies make a good living offering courses in the top word processing programs.

There is also the difficulty of moving to a new, more advanced word-processing program once the users have gone through the learning process. The commands vary from program to program, and changing programs means learning a whole new set.

Even so, the benefits of word processing are attractive enough for it to join financial modelling, data management, and accounting software in the big league.

WHAT ELSE WILL COMPUTERS BE ABLE TO DO?

To date, the computer revolution has been astonishingly rapid, but future changes promise to be more so. Not so far ahead too are a generation of computers which are intelligent enough to think for themselves and converse with us in everyday language

Hectic though the pace of development has been, the future years of computing will look like the history so far, but with change even more rapid. Computers will continue, for example to get more powerful and cheaper. It is a commonplace that the computer you can buy from a chainstore with a week or two's pay can do more, more quickly, than the early giant computers that filled office blocks and needed special grants from defence departments to pay for them. The wide availability of computing power has taken the machines into areas that were difficult to imagine even a decade ago: this obviously will continue.

A pleasant irony of the development of computers is that the more advanced the technology becomes, the less need there is to understand it. The most obvious developments that will turn up in computer catalogues are in speed and memory: but the result of these will be more versatile and more accessible machines.

One way of assessing speed in a computer is in terms of the amount of information that the computer can accept at a time. Nowadays, home computers and most business computers deal with eight bits at a time. But there are already micro-computers available that can handle 16 or 32 bits at a time – '16-bit' and '32-bit' machines, and these will gradually become the standard. The reason this hasn't happened overnight is that there is not yet a vast range of software for the new machines. But the change is only a matter of time.

So, too, is the extension of memory – of RAM. There was a time when even the business user had to be content with 16K of RAM, which nowadays is at the lower end of the home-computer's range. Business machines now normally have 64K: soon the 128K that is available only on some computers will be standard.

The changes will increase what computers can do: but the extra power will certainly be used to make the machines more accessible. We feel that computers are everywhere already, but really, they have only started on the road to widespread usage. People still use conventional typewriters, not word processors. In general small businesses keep their accounts on paper, and thus lack really up-to-date information. Reference libraries are still usually shelves of books and journals demanding a fair amount of skill in their use. As computers become more accessible, their use will extend more generally into these areas.

A simple example of the growing accessibility of computing occurs in word processing. Time was when each editing operation was controlled by what seemed to be an arbitrary combination of keys that constituted a command. Now programs tend to ask if you want to move a sentence, say, and then ask which sentence you want to move. People used to be sent away on word-processing courses: now, even a humble machine will have a word processing package that will teach you all you need to know.

Demystification will continue: the keyboard could disappear. This is at present a familiar feature: we use it to tell the computer to present a file on the screen and also to put information into the file, for example. But Apple's two new computers, the Lisa and the Macintosh use a completely different approach. The screen presents you with a selection of 'icons' – images of conventional office furniture. To instruct the computer, you use a 'mouse'. This is a small control, on wheels, connected by cable to the computer. As you move the mouse about on the desk top, the cursor moves around the computer's screen. If you wish to consult a file, for example, you move the cursor to the filing cabinet, and press the trigger to 'open the drawer'. Then you can move the 'paper' from the drawer into the centre of the screen to consult it. And if you have finished with it after this, you carry it to the wastepaper basket and drop it in: which cleans it off the computers memory. All instructions can be carried out in this visual way, and although at present, the information is typed in, it is possible to generate an image of the keyboard on the screen and 'type' on this.

Similarly, Hewlett Packard make a computer with a "touch sensitive screen". The operator puts a finger directly on to the screen to issue a command.

Yet another approach to the keyboardless computer is the machine that is voice controlled. These are in their infancy. They will certainly become widespread. It isn't that difficult to get even your home computer to talk to you, and there are business computers, some designed for the blind, that will tell you what is written on the screen. But at present, voice commands are rudimentary. With a fair amount of expertise, you can adapt a computer so that it will recognise particular spoken commands, but these are usually orders for actions, such as unlocking a door or switching on a light. We are a long way from the 'secretarial computer' that will, in the conventional sense, 'take a letter'. But the technology is on its way.

The increasing power of computers will be used to extend what they already do, as well as making it easier to get them to do it. Business users have quickly recognised the value of computer graphics which can rapidly produce graphs in different forms that give a vivid, often new view of their figures and projections. They can see changes and relationships that would be difficult to spot from the figures alone. The wider use of colour extends this: graphs become even more clear and easy to follow.

Another development is the use of the multiscreen – the window. It is possible to run two programs simultaneously on a modern computer, showing the results on two patches – 'windows' – on the screen. You can, for example, summon last year's results from a data bank and use some of the information in a new projection. A writer can keep the pages of his notes visible in one window while word processing his masterpiece in another.

What all this – ease of use, greater facilities – means is that computers will be more widely used than ever. They are still, for example, not much used by small businesses, nor by most writers, nor, again, by reference libraries. This will change. We may never reach a paperless society, but the idea of a library that consists of a mile or two of shelving, or of a company's records that consist of a stack of leather bound books will soon seem, correctly, archaic.

The paperless world would give a surprising freedom. The way that a spreadsheet lets a businessman try out ideas, see what happens if a change is made, is one example. It would be a near intolerable task if all the results had to be put on to paper: on a screen, changes can be made as quickly as they can be thought up.

This applies outside the world of business figures. Look, for example, at computer aided design (CAD) The engineer can build, say, the laws of aerodynamics into a computer program and then try out different car shapes. There is no need to use wind-tunnel tests until the design is being refined.

There are a number of 'paint box' programs that give graphic designers a similar freedom. The designer can choose, from a 'menu' of brushes and then work with another 'menu' of colours to generate images on the screen. Ideas for the cover of a magazine, say, or design of a food package can be tried out, inspected, rotated in space – all in the speedy impermanence of a computer screen.

When computers were first talked about, they were rather erroneously often called 'electronic brains'. But in those days, they didn't do much that could be called reasoning or thinking. Now 'artificial intelligence' is a well-developed subject, and the computer that appears to think is with us. These are not all-purpose, omnipotent geniuses: rather, they take on particular intellectual tasks.

One approach to this is the 'expert system'. An expert system is given a store of facts relevant to the problems it is expected to solve and then makes decisions based on these facts. One growing application of expert systems is diagnosis in medicine. At first, this seems an alarming intrusion into a personal relationship where diagnosis is a matter of wisdom and experience. But doctors nowadays are frequently confronted with diseases that are totally outside their experience – one imported by a traveller, for example. The doctor can consult a computer based expert system, reporting his observations, and making new ones as the computer requests. The computer will eventually suggest a diagnosis and, if requested, explain how it reached its decision. A doctor's diagnosis has to be based on knowledge: an expert system can have more knowledge than any human can keep in mind.

Tasks, like diagnosis, where there is a body of knowledge and a more or less established procedure for using it are open to expert systems. They can be used in chemical analysis, for example, or the design of possible new pharmaceutical drugs. Here, the researcher may know what physical shape the molecule of the drug must have if it is to be effective: the computer can be asked to suggest chemical compounds with the required shape, and even to propose ways of making them.

Real artificial intelligence will come closer with the "Fifth Generation" of computers. These will appear to the user to be fully intelligent machines. We shall use more everyday language to speak to them – not a computer language; we shall be able to talk instead of writing; and if we are a bit vague about what we want the machine to do, they will 'think' about what we have said and ask questions to clear our minds and theirs. They will handle knowledge freely, and very rapidly, running through different parts of a thinking process in parallel, as the human mind does, not in series, as most computers do. These fifth generation computers will have enormous memories, and they will be so cheap as to be ubiquitous, having a place in every human activity. It is far from certain that the countries that lead at present in computer design – the USA, Britain, the countries of the West – will be those that dominate the Fifth Generation. Japan, in particular, has decided that it is too late to challenge the West in present-day computer technology, and is therefore pinning its hopes on leapfrogging into the Fifth Generation machines. The computer companies, not to say the governments, of the West are looking at these plans a bit nervously. There was a time, they recall, when there were no Japanese motorcycles or motorcars.

ILLUSTRATION BY GEORGE HARDIE

THE SPEAKER
THE BOOK
THE PALETTE
THE LISTENER
MULTI-
SCREEN
TRANSALATION
NO KEYBOARD
READ
DRAW
WPB
FILE
PAPERLESS
LISTEN
SPEAK
DIAG
NOSIS
5TH
GENERATION
K SERA SERA

READ MORE ABOUT THEM

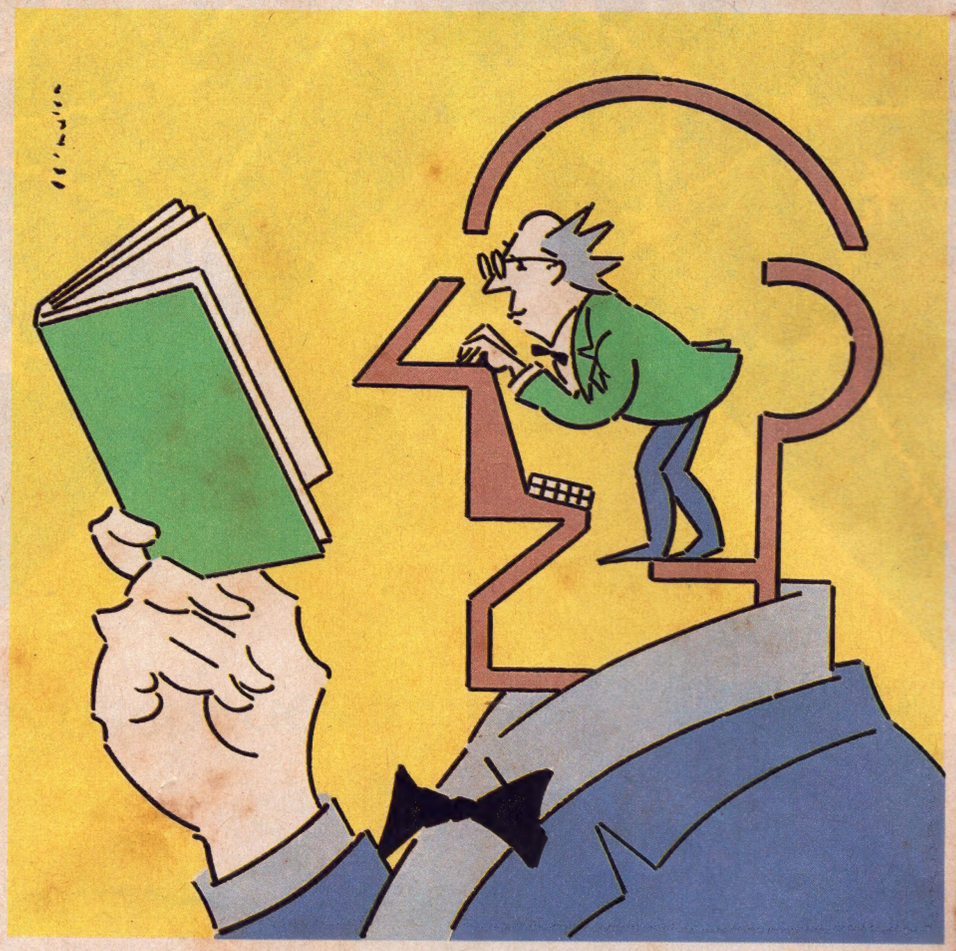


ILLUSTRATION BY BRIAN GRIMWOOD

Thousands of microcomputing titles are published every year. Some are original, many repeat information available in the manuals supplied with machines. It is because manuals are sometimes less than crystal clear that a large market for independent handbooks exist. The selection listed here is of necessity concise, and does not imply that books not mentioned aren't worth considering.

The Penguin Computing Book Susan Curran and Ray Curnow, Penguin, £5.95. In depth, solid and slightly formal but it assumes no knowledge of electronics or computers. A good reference book, with a good index.

DICTIONARIES AND GLOSSARIES

Dictionary of New Information Technology by Jack Meadows, Century, £4.95. Sensibly flags words used in definitions which are themselves headwords in the dictionary.

A Dictionary of Minicomputing and Microcomputing by Philip E Burton, John Wiley & Sons, £15.75. Larger type than the above, but also a good source of sorting out the definitions.

GENERAL BACKGROUND

Chips, Computers and Robots by Judy Allen, Puffin, 95p. This is by far the best beginners' introduction to what microtechnology is all about. Bite-sized chapters, clear explanations, and just right for novice over-16s to under-90s.

The Naked Computer by Jack B Rochester and John Gantz, Arlington Books, £9.95. Fascinating, entertaining and, more to the point, accurate both for people who need to be apparent experts on all kinds of computers – by yesterday.

The Joy of Computers by Peter Laurie, Hutchinson, £9.95. Follows naturally from the above in title only. An informative, all-embracing coffee-table book for shy computer illiterates.

FOR SPECIFIC COMPUTERS

Getting Started on Your Spectrum by Tim Hartnell, Futura, £2.95. Good from-the-beginning guide to programming with the Specturm, with sound theoretical approach backed up by "hands-on" examples. This book should be read before moving on to. . .

An Expert Guide to the Spectrum by Mike James, Granada, £6.95. A more technical guide for improvers rather than beginners, it gets into interfacing and memory mapping. It's a friendly and reliable next step after you've mastered the manual.

I Wish I Knew. . . About the Spectrum and the ZX81 by Jonathan Chapple, Pitman £4.95. A typical example of a manual re-write. Although it contains no more information about the machines than the manuals, it lays it all out with more white between the letters and greater use of diagrams. If all else fails, you could turn to this.

Step by Step Programming ZX Spectrum by Ian Graham, Dorling Kindersley. Two books, £5.95 each. A two-book course in A4 format. Because it is illustrated with photographs of computer output actually on the TV screen, it is unlikely to have typographical errors in the program listings. A BBC version is also available in the same series.

The Friendly Computer Book by Jonathan Inglis, BBC, £4.50. An excellent guide to Basic programming on the BBC, RML 380Z and Sinclair Spectrum. Worth a look by owners of other machines too.

Invaluable Utilities for the BBC Micro by Jeff Aughton, Pan, £5.95. Strictly speaking, this is not for the absolute beginner, but it is worth acquiring as a dig-and-delve works which you will soon grow into.

Basic Programming on the BBC Micro by Neil and Pat Cryer, Prentice Hall International, £5.95. This husband and wife team write clear and well-paced books and are worth following for other titles as well.

Beginners Basic for the CBM 64 by Peter Holmes and Derek Bush, Honeyfold, £14.95. This is a book plus tape pack from a small publisher beginning to make a mark in the high street. It is one of a series called Dr Watson (elementary?) which includes similar titles for PET, VIC 20, BBC, Apple, Dragon and Electron machines. There's a lot of work to do, but you'll be glad you did it.

Pet Personal Computer for Beginners by Seamus Dunn and Valerie Morgan, Prentice Hall, £5.95. Lots of examples, giving the reader a thorough work-out.

The Easy Guide to Your Commodore 64 by J. Kascmer, Sybex, £7.95. Jargon-free practical explanations of the 64 in word processing, budgeting and so forth. There's a guide to programming and how to use commercial packages.

How to Program the Apple II (If you've never programmed a computer before) by Rohan Cook and Tim Hartnell, Interface, £5.95. A very attractive title for beginners which lives up to its promise. Lots of programs to type in and try. Typing listings is an essential activity for learners on any make of computer, since it familiarises you with keywords and teaches you about debugging – what happens as you try and locate your typing mistakes.

Learning to Use the Atari 600/800 XL by Susan Fry, Gower, £4.95. A well-produced, well-written, simple guide with self-tests at the end of each short chapter. One of a series covering all the popular machines.

IBM PC and XT Owners' Manual Chertok, Rosenfield and Stone, Prentice Hall, £13.45. The reorganised *PC Manual* with a small amount of supplementary information. It is more friendly than the original and has general sections on disks, printers and components applicable to most disk-system personal computers.

BUSINESS/APPLICATIONS/ EDUCATION

Making a Business of Information, HMSO, £4.20. How to make money out of computing. A concise and, at £4.20 for 50 pages, terse, statement of where new business opportunities lie. Future millionaire computer novices start here.

Database Primer by Christopher Date, Addison Wesley, £9.50. A straightforward introduction to what databases (electronic index manipulators) are and how they are used, with examples.

LANGUAGES

(A knowledge of Basic is assumed in most books on other languages)

Logo Programming by Peter Ross, Addison Wesley, £8.95. Entertaining book on cheap paper, this is a practical introduction to Logo and turtle graphics, based on Apple Terrapin Logo with notes and appendices for other versions.

Programming in C for the Microcomputer User by Robert J Traister, Prentice Hall, £17.50. Just right for the competent Basic user who doesn't yet know what a compiler is. C is the favourite language of the major software houses.

A Beginner's Guide to Lisp by Tony Hasemer, Addison Wesley, £8.95. Lisp is one language which is easier to learn before Basic, so real beginners are at an advantage here. The book informs through projects, based on Acornsoft Lisp. A substantial appendix contains customising notes for the versions used by other machines.

Writing in the Computer Age by Andrew Fluegelman and Jeremy John Hewes, Century, £5.95. Word processing makes writing easier: this book, targeted at writers in particular, explains why and how.

SPREADSHEETS

In spite of the thousands of titles mentioned in the introduction, there isn't a single "Understanding Spreadsheets" book available, although several publishers have them in preparation. In the meantime you could try *Mastering VisiCalc* by Douglas Hergert, Sybex, £6.95. Although it only deals with a particular software product, it gives a clear picture of the principles of spreadsheeting and financial modelling, suitable for newcomers.

Computers in Language Learning by John Higgins and Tim Johns, Collins, £5.95. A good basic book for every beginner, improver or professional interested in how computers work in the classroom. It deals with a wide range of CAL (Computer Assisted Learning) activities. An informative, readable digest, it also has an excellent bibliography.

Solving Business Problems by Computer by Kate Behan and Diana Holmes, Fontana, £4.95. An Anglicised version of a successful Australian original, it includes chapters on identifying areas suitable for automation, software and hardware configurations, with appendices on languages.

Next week's issue of the Sunday Times Magazine sees the start of a new computer column, introduced by our new computer editor, Jane Bird. News about computing is also published in *The Sunday Times*'s Innovations pages in Business News, and Computer Horizons appears each Tuesday in *The Times*.

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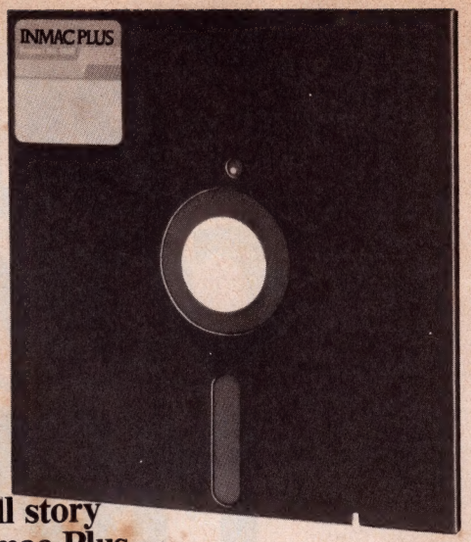
The only floppy disk guaranteed to work first time, every time... for your lifetime: Inmac Plus.



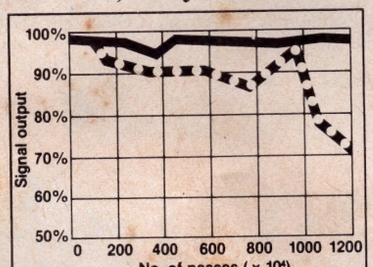
Here is news of a major breakthrough for all floppy disk users — a floppy disk that is error free, reliable, accurate and guaranteed forever!

You told us you needed a reliable floppy disk.

When we asked you — the floppy disk user — what you needed, you told us "reliability and accuracy." After nearly two years of research and testing together with a major manufacturer, we can now offer you a floppy disk that is so reliable and accurate, that we can **guarantee it for your lifetime! Should an Inmac Plus disk ever fail to perform to your satisfaction, we will replace it immediately! If it fails the initializing or formatting routine, we will replace it with two disks!!** How can we make such a shattering claim? The secret is the advanced technology . . .

The Secret of Inmac Plus Reliability.

1. Inmac Plus works first time, every time. The first thing you will notice that is different about Inmac Plus is the blue hub ring. There is no better protection for your diskette against the warps, dents, burrs and tears caused by your drive's clamping hub.



After 11 million passes, Inmac Plus disks (top trace) retain nearly 100% of their original output. The lower trace represents a typical competitive brand.

2. Flake proof oxide coating gives your data effective protection. Diskettes normally have hard coatings that gradually break down and flake under everyday stress of drive heads and pressure pads; this causes costly read/write errors and can damage your disk drives. Inmac Plus disks have a flexible oxide coating which resists breakdown over time.

3. Inmac Plus does not wear down like other disks. Friction from drive heads and pressure pads is a major cause of wear and tear to a diskette. The Inmac Plus disk has a special cured lubricant that lasts and lasts.

4. 100% Error Free. The mylar substrate of the floppy undergoes a special annealing process in manufacture which improves reliability by resisting expansion and contraction due to variations in temperature and humidity. Inmac's unique testing routines are to stringent specifications to ensure Inmac Plus floppies are 100% error free.

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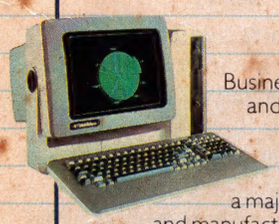
BUSINESS COMPUTERS. MOVE OVER.

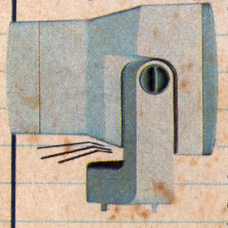


MOVING WITH YOU.

Business Computers, here and in the U.S.A., are having to move over to make way for TeleVideo. TeleVideo is a major force in the design and manufacture of micro computing equipment. And there is nothing secret about the reasons for our remarkable success. For a start, at TeleVideo we look at Business Computing from your point of view. This means that you won't find, after a year or two, that you've outgrown your system.

TeleVideo provides an unusually wide range of products – twenty at the moment – designed to allow your system to grow as your business grows. So you won't have to throw away your first portable or desk-top unit when you need network and multi-user facilities.

Equally important, at TeleVideo we consider the needs of the computer operators as much as the computers themselves. For example, the screen of the TeleVideo can be tilted – so whatever your height, you can work in comfort. Even the design of the keyboard is particularly thoughtful, recognising that hands need a place to rest as well as to operate. The more you get to know TeleVideo, the more you will appreciate why it has become the choice for companies on the move.



A RELIABLE MOVE.

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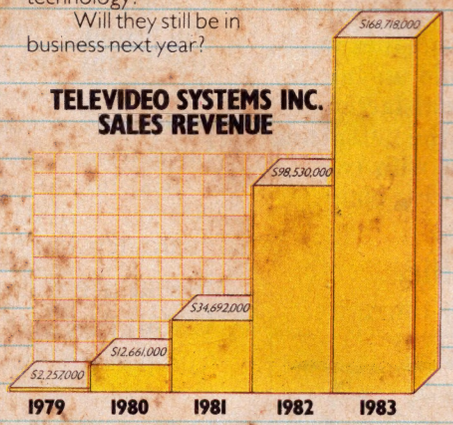
Are the manufacturers using the right technology?

Will they still be in business next year?



Will I be able to use the latest software developments, now and in the future?

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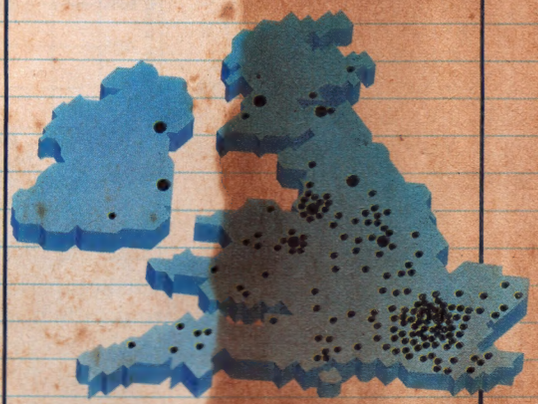
To support its dealers, THORN EMI is on hand, both to deal with any problems and to maintain the constant flow of new products that keep TeleVideo always one move ahead in its field. Now its your move.

To find out more about the TeleVideo Business Computer range, contact **THORN EMI TeleVideo Marketing,** Silbury Court, 372 Silbury Boulevard, Witan Gate East, Central Milton Keynes, MK9 2AF or Tel: (0908) 668778.



TELEVIDEO. THE COMPUTER THAT MOVES WITH THE TIMES.

THORN EMI TeleVideo Business Computers